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NASA/SP—1998—7037/SUPPL385
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AERONAUTICAL ENGINEERING

A CONTINUING BIBLIOGRAPHY WITH INDEXES



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Typical Report Citation and Abstract

- ① 19970001126 NASA Langley Research Center, Hampton, VA USA
- ② Water Tunnel Flow Visualization Study Through Poststall of 12 Novel Planform Shapes
- ③ Gatlin, Gregory M., NASA Langley Research Center, USA Neuhart, Dan H., Lockheed Engineering and Sciences Co., USA;
- ④ Mar. 1996; 130p; In English
- ⑤ Contract(s)/Grant(s): RTOP 505-68-70-04
- ⑥ Report Note(s): NASA-TM-4663; NAS 1.15-4663; L-17418; No Copyright; Avail: CASI; A07, Hardcopy: A02, Microfiche
- ⑦ To determine the flow field characteristics of 12 planform geometries, a flow visualization investigation was conducted in the Langley 16- by 24-Inch Water Tunnel. Concepts studied included flat plate representations of diamond wings, twin bodies, double wings, cutout wing configurations, and serrated forebodies. The off-surface flow patterns were identified by injecting colored dyes from the model surface into the free-stream flow. These dyes generally were injected so that the localized vortical flow patterns were visualized. Photographs were obtained for angles of attack ranging from 10° to 50°, and all investigations were conducted at a test section speed of 0.25 ft per sec. Results from the investigation indicate that the formation of strong vortices on highly swept forebodies can improve poststall lift characteristics; however, the asymmetric bursting of these vortices could produce substantial control problems. A wing cutout was found to significantly alter the position of the forebody vortex on the wing by shifting the vortex inboard. Serrated forebodies were found to effectively generate multiple vortices over the configuration. Vortices from 65° swept forebody serrations tended to roll together, while vortices from 40° swept serrations were more effective in generating additional lift caused by their more independent nature.
- ⑧ Author
- ⑨ *Water Tunnel Tests; Flow Visualization; Flow Distribution; Free Flow; Planforms; Wing Profiles; Aerodynamic Configurations*

Key

- 1. Document ID Number; Corporate Source
- 2. Title
- 3. Author(s) and Affiliation(s)
- 4. Publication Date
- 5. Contract/Grant Number(s)
- 6. Report Number(s); Availability and Price Codes
- 7. Abstract
- 8. Abstract Author
- 9. Subject Terms

AERONAUTICAL ENGINEERING

A Continuing Bibliography (Suppl. 385)

OCTOBER 16, 1998

01 AERONAUTICS

19980218777 Institute for Human Factors TNO, Soesterberg, Netherlands

Acquisition of Sea Targets, Part 2, ACQUIRE Evaluation for CCD Camera Imagery. *Interim Report Doelacquisitie op zee. Deel 2: ACQUIRE evaluatie voor CCD camera-beelden*

Bijl, P., Institute for Human Factors TNO, Netherlands; Nov. 03, 1997; 36p; In English

Contract(s)/Grant(s): A93/KL/350

Report No.(s): TNO-TM-97-A067-PT-2; TD-97-0250-PT-2; Copyright: Avail: Issuing Activity (TNO Human Factors Research Inst., Kampweg 5, 3769 DE Soesterberg, The Netherlands); US Sales Only, Hardcopy, Microfiche

In an observer experiment, air-to-surface and surface-to-surface identification and classification performance with a CCD camera system were measured for (simulated) ship targets. The experiment was specifically designed for target acquisition (TA) model evaluation and improvement. Target type, target aspect angle, viewing depression angle, target contrast and range were varied systematically to be able to quantify the effects of each of these variables on acquisition performance independently. Both trained civilian and experienced navy observers participated in the experiment. The results were used to test several basic assumptions in the TA model ACQUIRE, and to evaluate this model for acquisition of surface targets with a CCD camera system. The most important results of the evaluation are: (1) ACQUIRE needs tuning to correctly predict mean acquisition performance for sea targets: optimal Johnson criteria are 9 cycles per target effective dimension for identification at the 50% correct level and 4 cycles for classification, (2) acquisition range is approximately proportional to the square-root of the target area, as assumed in the 1990 and subsequent ACQUIRE versions, (3) acquisition range increases more rapidly with target contrast (80-90% over the entire contrast range) than predicted by the model on the basis of the camera MRC, (4) with the above cycle criteria, 95% of the predicted acquisition ranges fall between approximately 0.5 and 2.0 times the actual acquisition range, and (5) the model may be used by the Navy as a practical tool to give an indication of mean acquisition performance (averaged over targets), but does not correctly predict acquisition ranges for individual targets. A considerable improvement of ACQUIRE may be achieved when the MRC is replaced by a curve that better describes the effect of contrast on electro-optical system performance.

Author

Target Acquisition; Experimentation; Experiment Design; Radar Tracking

19980218796 Cranfield Univ., Coll. of Aeronautics, Bedford, UK

Instability and Transition of Flow at, and Near, an Attachment-Line: Including Control by Surface Suction

Smith, A., Cranfield Univ., UK; Poll, D. I. A., Cranfield Univ., UK; Jul. 1998; 51p; In English

Contract(s)/Grant(s): NCC1-218; RTOP 538-05-15-01

Report No.(s): NASA/CR-1998-208443; NAS 1.26:208443; No Copyright: Avail: CASI; A04, Hardcopy; A01, Microfiche

Experiments have been performed on an untapered, swept cylinder model in the Cranfield College of Aeronautics 8 ft x 6 ft low-speed wind tunnel to investigate the effect of surface transpiration on the process of relaminarization in the attachment-line boundary layer. Suction coefficients for complete suppression of turbulence were determined as a function of Reynolds number and spanwise distance. The effect of attachment-line suction on the spanwise propagation of gross disturbances emanating from the fuselage-wing junction region was also studied. Finally, the effect of blowing on a laminar attachment-line boundary layer was also considered and excellent agreement was achieved with previous studies.

Author

Laminar Boundary Layer; Control Surfaces; Boundary Layers; Reynolds Number; Transition Flow; Turbulence; Wings

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces, and internal flow in ducts and turbomachinery

19980215696 Arnold Engineering Development Center, Arnold AFS, TN USA

Pressure Sensitive Paint Data on the Transonic Technology Wing Demonstrator (TST) in the AEDC Propulsion Wind Tunnel 16T. *Final Report, Aug - Nov, 1997*

Sellers, M. E., Arnold Engineering Development Center, USA; Jun. 1998; 153p; In English

Report No.(s): AD-A349786; AEDC-TR-98-3; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

An improved prototype Pressure Sensitive Paint (PSP) data acquisition and processing system was used to acquire surface pressure data using PSP on the Dornier Alpha Jet with a TranSonic Technology (TST) Wing in the AEDC Propulsion Wind Tunnel 16T. A paint formulation developed at the University of Washington was used because of its superior performance characteristics. The process that permits the determination of surface pressure from the paint is described, as well as the image processing that is required. Also, the special illumination and detection components that make up the data acquisition system are presented. Comparisons of conventional pressure measurements and Computational Fluid Dynamics (CFD) results made with the PSP data are presented.

DTIC

Flow Visualization; Wind Tunnel Tests; Paints; Data Acquisition; Pressure Measurement; Technology Assessment; Computational Fluid Dynamics

19980215707 Naval Postgraduate School, Monterey, CA USA

Identification of Random Loads Impinging on the RAH-66 Comanche Helicopter Empennage Using Spectral Analysis

Mason, Patrick H., Naval Postgraduate School, USA; Jun. 1998; 155p; In English

Report No.(s): AD-A349809; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

The Army RAH-66 Comanche Helicopter is currently undergoing developmental flight testing. The empennage of the aircraft is experiencing buffeting where the horizontal and vertical tail vibrate at resonant frequencies. These high buffet loads are manifested in higher than anticipated fitting loads, particularly on the tail, and vibrations in the crew stations and at the nose cone where the targeting sensors are located. Significant effort has been devoted to identifying the sources of excitation and the nature of the structural response. This thesis determines the location and magnitude of empennage vibratory airloads. Because the nature of the excitation is a random function, spectral analysis is used. To obtain the loads, a three step process was utilized. First, from aircraft differential pressure transducers and accelerometers, the spectral content of the response and excitation was determined. Then, using a NASTRAN model modified to replicate the flight test aircraft, frequency response functions were determined between selected points on the aircraft's tail and the accelerometers. Finally, using this information, a solution was obtained for the vibratory airloads. Having provided information on the nature of the driving forces, structural modifications can be made that move the natural frequencies away from the frequencies of the applied airloads.

DTIC

Flight Tests; Tail Assemblies; Aerodynamic Loads; Buffeting; Flight Characteristics; Functional Analysis; Helicopters; Spectrum Analysis; Structural Vibration

19980217080 Institute for Computer Applications in Science and Engineering, Hampton, VA USA

Progress in Favre-Reynolds Stress Closures for Compressible Flows

Adumitroaie, V., State Univ. of New York, USA; Ristorcelli, J. R., Institute for Computer Applications in Science and Engineering, USA; Taulbee, D. B., State Univ. of New York, USA; Jun. 1998; 41p; In English

Report No.(s): AD-A349756; ICASE-98-21; NASA-L-CR-1998-2078423; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A closure for the compressible portion of the pressure strain covariance is developed. It is shown that, within the context of a pressure strain closure assumption linear in the Reynolds stresses, an expression for the pressure dilatation can be used to construct a representation for the pressure strain. Additional closures for the unclosed terms in the Favre Reynolds stress equations involving the mean acceleration are also constructed. The closures accommodate compressibility corrections depending on the magnitude of the turbulent Mach number, the mean density gradient, the mean pressure gradient, the mean dilatation, and, of course, the mean velocity gradients. The effects of the compressibility corrections are consistent with current DNS results. Using the compressible pressure strain and mean acceleration closures in the Favre Reynolds stress equations an algebraic closure for the Favre Reynolds stresses is constructed. Noteworthy is the fact that, in the absence of mean velocity gradients, the mean density gradient produces Favre Reynolds stresses in accelerating mean flows. Computations of the mixing layer using the compressible

closures developed are described. Favre Reynolds stress closure and two equation algebraic models are compared to laboratory data. The mixing layer configuration computations are compared to laboratory data; since the laboratory data for the turbulence stresses is inconsistent, this comparison is inconclusive. Comparisons for the spread rate reduction indicate a sizable decrease in the mixing layer growth rate.

DTIC

Compressible Flow; Mathematical Models; Mixing Layers (Fluids); Closures; Compressibility; Shear Stress

19980218148 Naval Surface Warfare Center, Dahlgren, VA USA

User's Guide for an Interactive Personal Computer Interface for the 1998 Aeroprediction Code (AP98) *Final Report*
Hymer, Thomas C., Naval Surface Warfare Center, USA; Moore, Frank G., Naval Surface Warfare Center, USA; Downs, Cornell, Naval Surface Warfare Center, USA; Jun, 1998; 134p; In English

Report No.(s): AD-A349712; NSWCDD/TR-98/7; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

This report describes interactive, user friendly, pre-processing and post-processing personal computer (P.C.) modules designed to operate with the latest version of the Naval Surface Warfare Center (NSWC) Aeroprediction Code (AP98). As part of the preprocessing input module, geometry inputs are automated by giving the user many options. By using this new software, a set of aerodynamic coefficients can be obtained on most weapon configurations in less than 15 minutes from time of initial setup to computer outputs, compared to 2-4 hours for the AP98 computer mainframe version. While the computer cost savings are modest (the AP98 executes on a large computer in less than a second), the manpower savings and productivity enhancements can be significant. Various plots of the aerodynamic coefficients are available to the user and are plotted automatically by the post-processing module. Data output is also made available to the user in the form of standard Aeroprediction output files as well as tabulated data. The User's Guide is designed to aid users of the AP98 by correlating AP98 P.C. Interface Data Inputs and the corresponding source code variable names.

DTIC

Aerodynamic Configurations; Preprocessing; Personal Computers; User Manuals (Computer Programs)

19980218172 NASA Langley Research Center, Hampton, VA USA

CFL3D User's Manual (Version 5.0)

Krist, Sherrie L., BaNANePOS, Inc., USA; Biedron, Robert T., NASA Langley Research Center, USA; Rumsey, Christopher L., NASA Langley Research Center, USA; Jun, 1998; 370p; In English

Contract(s)/Grant(s): RTOP 522-31-61-02

Report No.(s): NASA/TM-1998-208444; NAS 1.15:208444; L-17702; No Copyright; Avail: CASI; A16, Hardcopy; A03, Microfiche

This document is the User's Manual for the CFL3D computer code, a thin-layer Reynolds-averaged Navier-Stokes flow solver for structured multiple-zone grids. Descriptions of the code's input parameters, non-dimensionalizations, file formats, boundary conditions, and equations are included. Sample 2-D and 3-D test cases are also described, and many helpful hints for using the code are provided.

Author

User Manuals (Computer Programs); Applications Programs (Computers); Computational Fluid Dynamics; Navier-Stokes Equation; Turbulence Models; Multiblock Grids

19980218794 NASA Langley Research Center, Hampton, VA USA

Assessment of an Euler-Interacting Boundary Layer Method Using High Reynolds Number Transonic Flight Data

Bonhaus, Daryl L., NASA Langley Research Center, USA; Maddalon, Dai V., NASA Langley Research Center, USA; Aug, 1998; 43p; In English

Contract(s)/Grant(s): RTOP 522-11-51-02

Report No.(s): NASA/TP-1998-208461; L-17626; NAS 1.60:208461; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Flight-measured high Reynolds number turbulent-flow pressure distributions on a transport wing in transonic flow are compared to unstructured-grid calculations to assess the predictive ability of a three-dimensional Euler code (USM3D) coupled to an interacting boundary layer module. The two experimental pressure distributions selected for comparative analysis with the calculations are complex and turbulent but typical of an advanced technology laminar flow wing. An advancing front method (VGRID) was used to generate several tetrahedral grids for each test case. Initial calculations left considerable room for improvement in accuracy. Studies were then made of experimental errors, transition location, viscous effects, nacelle flow modeling, number and placement of spanwise boundary layer stations, and grid resolution. The most significant improvements in the accuracy

of the calculations were gained by improvement of the nacelle flow model and by refinement of the computational grid. Final calculations yield results in close agreement with the experiment. Indications are that further grid refinement would produce additional improvement but would require more computer memory than is available. The appendix data compare the experimental attachment line location with calculations for different grid sizes. Good agreement is obtained between the experimental and calculated attachment line locations.

Author

High Reynolds Number; Laminar Flow; Transonic Flow; Wings; Boundary Layers; Euler Equations of Motion; Unstructured Grids (Mathematics)

19980218795 NASA Ames Research Center, Moffett Field, CA USA

Two-Dimensional High-Lift Aerodynamic Optimization Using Neural Networks

Greenman, Roxana M., NASA Ames Research Center, USA; Jun. 1998; 146p; In English

Contract(s)/Grant(s): RTOP 519-10-42

Report No.(s): NASA/TM-1998-112233; A-9811759; NAS 1.15:112233; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

The high-lift performance of a multi-element airfoil was optimized by using neural-net predictions that were trained using a computational data set. The numerical data was generated using a two-dimensional, incompressible, Navier-Stokes algorithm with the Spalart-Allmaras turbulence model. Because it is difficult to predict maximum lift for high-lift systems, an empirically-based maximum lift criteria was used in this study to determine both the maximum lift and the angle at which it occurs. The 'pressure difference rule,' which states that the maximum lift condition corresponds to a certain pressure difference between the peak suction pressure and the pressure at the trailing edge of the element, was applied and verified with experimental observations for this configuration. Multiple input, single output networks were trained using the NASA Ames variation of the Levenberg-Marquardt algorithm for each of the aerodynamic coefficients (lift, drag and moment). The artificial neural networks were integrated with a gradient-based optimizer. Using independent numerical simulations and experimental data for this high-lift configuration, it was shown that this design process successfully optimized flap deflection, gap, overlap, and angle of attack to maximize lift. Once the neural nets were trained and integrated with the optimizer, minimal additional computer resources were required to perform optimization runs with different initial conditions and parameters. Applying the neural networks within the high-lift rigging optimization process reduced the amount of computational time and resources by 44% compared with traditional gradient-based optimization procedures for multiple optimization runs.

Author

Neural Nets; Angle of Attack; Navier-Stokes Equation; Lift; Incompressible Flow; Computers; Airfoils; Aerodynamic Configurations; Aerodynamic Coefficients

19980218899 NASA Dryden Flight Research Center, Edwards, CA USA

Forebody Flow Visualization on the F-18 HARV with Actuated Forebody Strakes

Fisher, David F., NASA Dryden Flight Research Center, USA; Murri, Daniel G., NASA Dryden Flight Research Center, USA; Sep. 1998; 14p; In English; 8th, Flow Visualization, 1-4 Sep. 1998, Loro, Italy

Contract(s)/Grant(s): RTOP 529-31-04-00-37

Report No.(s): NASA/TM-1998-206556; H-2254; NAS 1.15:206556; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Off-surface smoke flow visualization and extensive pressure measurements were obtained on the forebody of the NASA F-18 High Alpha Research Vehicle equipped with actuated forebody strakes. Test points at $\alpha = 50$ deg. were examined in which only one strake was deflected or in which both strakes were deflected differentially. The forebody pressures were integrated to obtain forebody yawing moments. Results showed that small single strake deflections can cause an undesirable yawing moment reversal. At $\alpha = 50$ deg., this reversal was corrected by deploying both strakes at 20 deg. initially, then differentially from 20 deg. to create a yawing moment. The off-surface flow visualization showed that in the case of the small single strake deflection, the resulting forebody/strake vortex remained close to the surface and caused accelerated flow and increased suction pressures on the deflected side. When both strakes were deflected differentially, two forebody/strake vortices were present. The forebody/strake vortex from the larger deflection would lift from the surface while the other would remain close to the surface. The nearer forebody/strake vortex would cause greater flow acceleration, higher suction pressures and a yawing moment on that side of the forebody. Flow visualization provided a clear description of the strake vortices fluid mechanics.

Author

Flow Visualization; F-18 Aircraft; Forebodies; Pressure Measurement

19980218945 NASA Langley Research Center, Hampton, VA USA

A Study of Supersonic Surface Sources: The Flowes Williams-Hawkings Equation and the Kirchhoff Formula

Farassat, F., NASA Langley Research Center, USA; Brentner, Kenneth S., NASA Langley Research Center, USA; Dunn, M. H., Old Dominion Univ., USA; 1998; 6p; In English; 4th; Aeroacoustics Conference, 2-4 Jun. 1998, Toulouse, France. Sponsored by American Inst. of Aeronautics and Astronautics, USA

Report No.(s): AIAA Paper 98-2375; No Copyright; Avail: Issuing Activity (American Inst. of Aeronautics and Astronautics, 1801 Alexander Bell Dr., Suite 500, Reston, VA). Hardcopy, Microfiche

In this paper we address the mathematical problem of noise generation from high speed moving surfaces. The problem we are solving is the linear wave equation with sources on a moving surface. The Flowes Williams-Hawkings (FW-H) equation as well as the governing equation for deriving the Kirchhoff formula for moving surfaces are both this type of partial differential equation. We give a new exact solution of this problem here in closed form which is valid for subsonic and supersonic motion of the surface but it is particularly suitable for supersonically moving surfaces. This new solution is the simplest of all high speed formulations of Langley and is denoted formulation 4 following the tradition of numbering of our major results for the prediction of the noise of rotating blades. We show that for a smooth surface moving at supersonic speed, our solution has only removable singularities. Thus, it can be used for numerical work.

Author

Supersonic Speed; Mathematical Models; Surface Noise Interactions; Wave Equations; Solid Surfaces

03

AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

19980215468 Bayview Research, Shalimar, FL USA

Fidelity Analysis for the OH-58D Kiowa Warrior Crew Trainer: *Final Report, Mar. 1997 - Feb. 1998*

Stewart, John E., II. Bayview Research, USA; Cross, Kenneth D., Bayview Research, USA; Wright, Robert H., Bayview Research, USA; Jun. 1998; 73p; In English; Sponsored in part by Army Research Institute, Fort Rucker, AL. Contract(s)/Grant(s): MDA903-87-C-0802

Report No.(s): AD-A347271; ARI-TR-1083; No Copyright; Avail: CASE; A04, Hardcopy; A01, Microfiche

The Army must balance cost and training effectiveness in acquiring a Kiowa Warrior Crew Trainer (KWCT). This entails determining the least fidelity required for specific training objectives, employing the least costly technology. A fidelity analysis was conducted which involved: (1) analysis of training requirements, (2) review of the literature, and (3) empirical assessment of a benchmark KWCT. Subject Matter Experts (SMEs) identified 13 tasks for which training in the aircraft alone was inadequate. It was concluded that the KWCT should train these tasks under the full range of visibility conditions and when affected by obscurants. The literature revealed virtually no data on display resolution required to train tasks other than target detection and identification. It also implied that a visual display system with adequate field-of-view (FOV) and resolution for target detection and identification at realistic standoff ranges would be prohibitively expensive. For the benchmark KWCT assessment, small sample size made performance evaluation difficult. Gunnery was more affected by degraded depth cues when resolution was low (480 lines), than when high (768 lines). Low resolution was perceived as inadequate for all tasks and high resolution as marginally adequate for gunnery. FOV was perceived as less critical to gunnery than to general flying.

DTIC

Effectiveness; Flight Simulation; Cost Effectiveness; Training Devices; Target Acquisition; Evaluation

19980218299 Naval War Coll., Newport, RI USA

Challenges for the Operational Leader Integrating Civil and Military Air Traffic during Operations Other Than War: *Final Report*

Muhlenberg, Laura J., Naval War Coll., USA; Feb. 13, 1998; 23p; In English

Report No.(s): AD-A348350; No Copyright; Avail: CASE; A03, Hardcopy; A01, Microfiche

Air traffic control must be fully integrated in a theater of operations to enable an operational commander to most effectively achieve tactical, operational, and strategic aims. The international aviation environment is increasingly complex and unreceptive to military operations perceived as jeopardizing safety or infringing on airspace access. Integrating air traffic during Operations Other Than War (OOTW) is particularly problematic due to the high volume and complexity introduced by civil aircraft in a more permissive environment. Aircraft mishaps involving civil aircraft are so visible that a single incident can damage the credibility of the USA and legitimacy of an operation. A global movement led by the International Civil Aviation Organization, affiliated

with the UN, is aggressively addressing international aviation safety problems - including the perceived dangers and intrusiveness that military operations present to civil aircraft. A lack of understanding and focus on air traffic functions contributed to the Black Hawk fratricide incident during Operation Provide Comfort, resulted in inadequate situational awareness during Operation Desert Storm, and have inadequately prepared AWACS to handle the complex and evolving airspace over Bosnia-Herzegovina. Fully integrating military and civil air traffic in a theater of operations can improve the operational commander's ability to shape the battlespace, achieve unity of effort, reduce fratricide, respond more effectively to evolving conditions, and positively shape international opinion.

DTIC

Military Operations; Civil Aviation; Air Traffic Control; Flight Safety; Damage; Aircraft Safety

19980218489 National Inst. of Standards and Technology, Fire Science Div., Gaithersburg, MD USA

Analysis of the Wright Patterson Full-Scale Engine Nacelle Fire Suppression Experiments

Hamins, A., National Inst. of Standards and Technology, USA; Cleary, T., National Inst. of Standards and Technology, USA; Yang, J., National Inst. of Standards and Technology, USA; Nov. 1997; 130p; In English

Report No.(s): PB98-148398; NISTIR-6193; No Copyright; Avail: Issuing Activity (Nat'l Technical Information Service (NTIS)), Microfiche

An analysis is presented on the full-scale suppression experiments conducted during 1996 and 1997 in the F-22 engine nacelle fire simulator at Wright Patterson Air Force Base. Experiments investigated the relative effectiveness of halogenated agents and solid propellant gas generators (SPGG) in suppressing a series of spray fires with and without a fuel re-ignition source. Several agents were tested including halon 1301, HFC-125, and two basic types of SPGG which included those that produced inert gases in conjunction with a fine solid particulate (some which contained K_2CO_3), and those that produced inert gases only. A number of measurements were made during the suppression tests. Measurements included gas temperatures, the re-ignition source temperature, the cold-flow agent concentrations (no fuel spray or fire present), and velocity measurements. This information was utilized to gain insight into the mechanisms of fire suppression with the different suppressant types. A simple model for SPGG delivery was developed. Assuming plug type flow, the transient average agent concentrations were calculated in the nacelle and compared to measurements.

NTIS

F-22 Aircraft; Nacelles; Aircraft Engines; Engine Inlets; Fires; Solid Propellants

19980218580 Federal Aviation Administration, Washington, DC USA

Notices to Airmen: Domestic/International

Mar. 26, 1998; 218p; In English

Report No.(s): PB98-157159; No Copyright; Avail: CASE; A10, Hardcopy: A03, Microfiche

The discussion includes the following: Airway Notams; Airports, Facilities, and Procedural Notams; General FDC Notams; Part 95 Revision to Minimum En Route IFR Altitudes and Changeover Points; International Notices to Airmen; and Graphic Notices.

NTIS

Air Navigation; Airports; Flight Paths; Air Traffic Control

19980218589 Federal Aviation Administration, Technical Center, Atlantic City, NJ USA

FAA/NASA Joint University Program for Air Transportation Research 1994-1995 *Final Report*

Remer, J. H., Federal Aviation Administration, USA; May 1998; 130p; In English

Report No.(s): PB98-159056; DOT/FAA/AR-98/3; No Copyright; Avail: Issuing Activity (Nat'l Technical Information Service (NTIS)), Microfiche

The Joint University Program for Air Transportation Research (JUP) is a coordinated set of three grants co-sponsored by the Federal Aviation Administration (FAA) and the National Aeronautics and Space Administration (NASA). Under JUP, three institutions: the Massachusetts Institute of Technology, Princeton, and Ohio Universities receive research grants and collaborate with FAA and NASA in defining and performing civil aeronautics research in a multitude of areas. Some of these disciplines are artificial intelligence, control theory, atmospheric hazards, navigation, avionics, human factors, flight dynamics, air traffic management, and electronic communications.

NTIS

Air Transportation; Control Theory; Aerodynamics; University Program; Air Navigation; Flight Hazards

04

AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

19980215471 Lockheed Martin Corp., Orlando, FL USA

Advanced Distributed Simulation Technology 2 Global Positioning System Interactive Simulation (GPS DIS) Experiment
Final Report

Feb. 23, 1998; 50p; In English

Report No.(s): AD-A347294; No Copyright; Avail: CASE; A03, Hardcopy; A01, Microfiche

The purpose of this final report is to document the ADST 2 effort which supported the Global Positioning System Distributed Interactive Simulation (GPS DIS) experiment. This report includes a full description of the experiment and its conditions. A lessons learned section is also included to improve the efficiency and performance of, and reduce the cost of, future experiments. It is also the intent of this report that the information contained be used to reduce the time required to prepare for and perform any future add-on effort to the GPS DIS experiment.

DTIC

Distributed Interactive Simulation; Computerized Simulation; Documentation

19980218115 Naval War Coll., Newport, RI USA

GPS Guided Munitions and Precision Engagement: Do National and Theater Targeting Agencies Fully Support the Joint Forces Commander *Final Report*

Edwards, Gene H., III, Naval War Coll., USA; Feb. 13, 1998; 25p; In English

Report No.(s): AD-A349235; No Copyright; Avail: CASE; A03, Hardcopy; A01, Microfiche

The introduction of GPS guided munitions (GGMs), including JDAM and JSOW, promises to have a profound, force-multiplying impact on the Joint Force Commander's (JFC) ability to deliver "precision" operational fires. The JFC's use of these new weapons however, will present several challenges which must be solved prior to wide scale GGM deployment. The all-weather standoff characteristics of GGMs dictate a change in weapons employment accountability. Additionally, the accurate, mensurated target coordinates on which GGMs rely will require the JFC to forge a more robust relationship with supporting theater and national agencies. This paper examines the impact that the deployment of GGMs will have on the JFC, analyses the recent "Silent Fury" C4ISR experiment, and makes recommendations to improve organizational processes prior to wide scale GGM initial operational capability.

DTIC

Global Positioning System; Weapons; Targets; Guidance (Motion)

05

AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

19980215458 Department of the Navy, Washington, DC USA

Duct Flow Control System

Rogers, Ernest O., Department of the Navy, USA; Mar. 17, 1998; 6p; In English; Supersedes US-Patent-Appl-SN-802701, AD-D018658

Patent Info.: US-Patent-Appl-SN-802701; US-Patent-5,727,381

Report No.(s): AD-D018950; No Copyright; Avail: CASE; A02, Hardcopy; A01, Microfiche

A duct fixed to a vehicle propelled through an ambient fluid medium is internally provided with spaced channel passages from which the fluid medium is ejected under pressure tangentially of local duct surfaces through Coanda affected slots at the trailing edge of the duct in which only the ejection of the fluid medium occurs. The supply of the pressurized fluid medium under selective control is divided to different angular segments of the channel passages in order to modify the flow stream through the duct so as to perform certain functions such as thrust control and steering control effects enhancing vehicle maneuverability.

DTIC

Ducts; Control; Fluid Flow

19980215710 Air Force Research Lab., Human Effectiveness Directorate, Wright-Patterson AFB, OH USA
Task Filtered Display of Functional Diagrams for Flightline Maintenance *Final Report, Jun. 1993 - Jan. 1997*
Wampler, Jeffrey L., Air Force Research Lab., USA; Mar. 1998; 22p; In English
Contract(s)/Grant(s): Proj-1710

Report No.(s): AD-A349857; AFRL-HE-WP-TP-1998-0023; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper discusses a proposed design of the display of simplified schematics and wiring diagrams in Interactive Electronic Technical Manual (IETMs) to support flightline maintenance. The paper reviews current theoretical and applied solutions to the display of large diagrams on small screen devices. A selected technique is implemented from a users perspective in demonstration software. The design is discussed with suggestions for future research.

DTIC

Aircraft Maintenance; Display Devices; Manuals

19980215716 Naval Postgraduate School, Monterey, CA USA

Dynamic System Identification and Modeling of a Rotary Wing UAV for Stability and Control Analysis

McEwen, Matthew D., Naval Postgraduate School, USA; Jun. 1998; 89p; In English

Report No.(s): AD-A349878; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This thesis presents a method for the dynamic system identification and simulation model development of a small rotary wing UAV. Using aerodynamic parameterization and linear state-space modeling techniques, the Bergen Industrial UAV was modeled for computer simulation to analyze its inherent stability and control characteristics. The NPS designed JANRAD software was utilized to determine the stability and control derivatives used in the simulation model. The identification of the UAV dynamic model will aid in the development of closed-loop controllers capable of autonomous UAV control. The fidelity of the simulation model was verified by comparing the simulation responses with data collected from on-board sensors during test flight.

DTIC

Pilotless Aircraft; Rotary Wings; Flight Tests; Helicopters; Automatic Control; Controllers; Dynamic Models; Feedback Control; System Identification; Stability Tests

19980216740 Rolls-Royce Ltd., Bristol, UK

Effective Condition Monitoring of Aero-Engine Systems Using Automated SEM/EDX and New Diagnostic Routines: RAF Tornado Aircraft RB199 Engine Condition Monitoring Project

Farrant, Nicholas W., Rolls-Royce Ltd., UK; Luckhurst, Terry, Royal Air Force, UK; Jan. 1998; 14p; In English

Report No.(s): AD-A347243; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Royal Air Force Tornado RB 199 Engine Support Authority has implemented an innovative, efficient and cost effective Wear Debris Monitoring (WDM) program through the successful application and adaptation of a commercial off the shelf Scanning Electron Microscope Energy Dispersive X-Ray (SEM/EDX) system. Combat aircraft engines, such as the RB 199, require conditional health monitoring of oil wetted components, specifically turbo components, for their protection against critical failure. Such monitoring maximizes component life, resulting in reduced logistic and mobility footprints, while enhancing operational availability and capability. The hostile operating environments of High Performance Turbine Engine Technology (HPTET) demand hardware robustness and/or a strategic investment in an enhanced tribology capability within the maintenance arena. For post design in-service engines the latter option using state of the art technology offers by far the more affordable option, with excellent potential, at lower initial investment, for the future higher performance combat aircraft engines. The transition of electron probe microanalysis to the field combined with accurate and precise diagnostic routines based upon reliability centered maintenance and hazard risk analyses realized an immediate payback to the RAF.

DTIC

Maintenance; Aircraft Engines; X Ray Spectroscopy; Monitors; Cost Effectiveness; Scanning Electron Microscopy

19980217087 Naval Postgraduate School, Inst. for Joint Warfare Analysis, Monterey, CA USA

Analytical Models for Mobile Sensor (UAV) Coverage of a Region

Gaver, D. P., Naval Postgraduate School, USA; Jacobs, P. A., Naval Postgraduate School, USA; Stoneman, J., Naval Postgraduate School, USA; May 1998; 21p; In English

Report No.(s): AD-A349719; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The effective use of mobile sensors (UAVs for example, but not exclusively) to investigate own and opponent force status in geographical regions requires planning to compensate for their limitations. These limitations include finite endurance, and realistic mission unreliability: the failure propensities of platform and sensing packages, and the consequent need for maintenance and logistics support. This paper supplies Analytical (Mathematical) Models (AMM) to assist planners, and the acquirers and

operational testers of mobile sensor assets. The results are formulas (that can be quickly evaluated numerically) for the expected time on station (fraction of time a region has sensor presence) of several cooperatively operating systems supported by several maintenance facilities. These results can be used to estimate the number of sensors of a particular type needed to cover a region adequately. Limited evidence indicates usefully satisfactory agreement between analytical model estimates and those from more detailed and elaborate Monte Carlo Simulations (MCS).

DTIC

Aircraft Maintenance; Remotely Piloted Vehicles; Mathematical Models; Measuring Instruments; Laser Gyroscopes

19980217118 Federal Aviation Administration, Office of Aviation Research, Washington, DC USA

Vertical Drop Test of a Beechcraft 1900C Airliner *Final Report, Jul. - Nov. 1995*

McGuire, R. J., Federal Aviation Administration, USA; Vu, T., Federal Aviation Administration, USA; May 1998; 92p; In English; Original contains color illustrations

Report No.(s): PB98-152770; DOT/FAA/AR-96/119; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

A commuter category Beechcraft 1900C airliner was subjected to a vertical impact drop test at the FAA William J. Hughes Technical Center, Atlantic City International Airport, New Jersey. The purpose of this test was to measure the impact response of the fuselage, cabin floor, cabin furnishings (including standard and modified seats), and anthropomorphic test dummies. The test was conducted to simulate the vertical velocity component of a severe but survivable crash impact. A low-wing, 19-passenger fuselage was dropped from a height of 11 ft. 2 in. resulting in a vertical impact velocity of 26.8 ft/sec. The airframe was configured to simulate a typical flight condition, including seats (normal and experimental), simulated occupants, and cargo. For the test the wings were removed; the vertical and horizontal stabilizers were removed; the landing gear was removed; and the pilot and copilot seats were not installed. The data collected in the test and future tests will supplement the existing basis for improved seat and restraint systems for commuter category 14 Code of Federal Regulation (CFR) Part 23 airplanes.

NTIS

Impact Tests; Beechcraft Aircraft; Fuselages; Airframes; Transport Aircraft; Impact Velocity; Drop Tests

19980218116 Naval War Coll., Newport, RI USA

UAVs: Holy Grail for Intel, Panacea for RSTA, or Much Ado about Nothing? UAVs for the Operational Commander *Final Report*

Fox, Roy W., Naval War Coll., USA; Feb. 13, 1998; 28p; In English

Report No.(s): AD-A349222; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Unmanned Aerial Vehicle (UAV) is a force multiplier for the operational commander. Characterized as either lethal or non-lethal and employed singularly or as a system of systems, they significantly enhance a combatant or joint force commander's ability to satisfy strategic, operational, and tactical objectives. UAVs have supported military operations including the Vietnam War, the 1983 Israeli War, the Gulf War and most recently the United Nations Peace Keeping Operation in Bosnia, to name a few. Although U.S. UAV acquisition programs have followed a very rocky road to date, slowing their evolution, their future is promising. Non-lethal UAVs are intended to operate as a system of systems to provide blanket coverage for the commander in conjunction with other manned and satellite systems. Non-lethal UAV missions include RSTA, intelligence, and BDA. Lethal UAVs are essentially smart bombs that can locate, identify and attack a target. If a suitable target is not identified, they can return to fight another day. Advantages to using UAVs over manned platforms are that they provide a low risk, highly efficient and effective, and low cost solution to fighting wars and MOOTW. This is especially important in today's world of decreasing resources and increasing responsibilities. Today, UAVs uniquely support the operational functions of Operational Art and are equally suited to supporting the operational concepts of Joint Vision 2010. Whether providing eyes on target, steel on target, or acting as a virtual communications satellite, UAVs provide the force commander with a low-risk high-payoff approach to warfighting. UAVs are a force multiplier for the operational commander.

DTIC

Pilotless Aircraft; Military Operations; Remotely Piloted Vehicles; Artificial Satellites; Warfare; Targets

19980218289 Naval War Coll., Joint Military Operations Dept., Newport, RI USA

Joint Vision 2010 and the Attack Helicopter: An Effective Dominant Maneuver Force for the Operational Commander *Final Report*

Robinson, Keith W., Naval War Coll., USA; Feb. 13, 1998; 21p; In English

Report No.(s): AD-A348432; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

With its ability to maneuver in the aerial dimension, the helicopter provides the operational commander with a degree of flexibility in meeting Joint Vision 2010's requirements for dominant maneuver that ground maneuver forces do not. While the positional advantages and staying power of ground maneuver forces are unique and cannot be replaced by other means, the attack

helicopter is an extremely effective, responsive, and highly lethal dominant maneuver force. Because of its unique ability to move quickly over a wide area and to respond quickly during both day and night, the attack helicopter provides the operational commander with a highly flexible maneuver force capable of performing a variety of missions across the entire range of military operations. Critics of the attack helicopter, however, focus on the issue of vulnerability. Current initiatives within the Army -- as well as with our allies, are aimed at minimizing the helicopter's vulnerability on the battlefield while maximizing its operational utility. Through organizational restructuring, cooperation with allies, advanced warfighting experiments, and the introduction of new aircraft designed to exploit the digitized battlefield, Army Aviation is committed to providing the operational commander of the future with the capability to dominate any military situation, from an urban fight to high-intensity combat.

DTIC

Helicopters; Effectiveness; Helicopter Performance; Military Helicopters

19980218292 Defence Science and Technology Organisation, Aeronautical and Maritime Research Lab., Melbourne, Australia
Analytical Predictions of Fatigue Crack Growth in the Lower Plate of the F-111 Wing Pivot Fitting Fuel Flow Hole Number 58

Murtagh, B. J., Defence Science and Technology Organisation, Australia; Walker, K. F., Defence Science and Technology Organisation, Australia; Feb. 1998; 26p; In English

Report No.(s): AD-A348395; DSTO-TN-0135; DODA-AR-010-459; No Copyright; Avail: CASI; A03, Hardcopy: A01, Microfiche

This report details a comparison of fatigue growth predictions for a fatigue crack in the lower plate of the F-111 Wing Pivot Fitting, adjacent to Fuel Flow Hole No 58. This is a known fatigue critical location and is designated as DI 86. Fatigue analysis using conventional fracture mechanics techniques and empirical retardation models performed by the manufacturer, Lockheed Martin Tactical Aircraft Systems (then General Dynamics), predicted a fatigue life of approximately 57,000 flight hours. An equivalent analysis was conducted using the analytical crack closure code, FASTRAN II, and this resulted in a life prediction of about 25,000 flight hours. Spectrum differences provide a partial explanation. A FASTRAN II analysis using a spectrum based on an in-flight strain measurement system known as AFDAS produced a shorter life again. Further work is underway to quantify the difference in the predictions due to spectrum differences, and that due to analysis techniques.

DTIC

Crack Propagation; Mathematical Models; Numerical Analysis; Fatigue (Materials); Jet Aircraft; Fighter Aircraft

19980218536 Goodrich (B. F.) Aerospace, Military Fuels and Integrated Systems, Vergennes, VT USA

In-Line Oil Debris Monitor (ODM) for Helicopter Gearbox Condition Assessment

Howe, B., Goodrich (B. F.) Aerospace, USA; Muir, D., GasTOPS Ltd., Canada; Jan. 1998; 9p; In English

Report No.(s): AD-A347503; No Copyright; Avail: CASI; A02, Hardcopy: A01, Microfiche

The development of an inline, full flow oil debris sensor system for the engine nose gearbox of a military helicopter is described. The sensor is designed as a direct one for one replacement of an existing magnetic chip detector, located in the scavenge oil line of the gearbox. The sensor is based on an inductive measurement technique which enables the system to detect, count and classify wear metal particles by size and type (ferromagnetic or non-ferromagnetic) with a detection efficiency of close to 100% above the minimum particle size threshold of approximately 175 microns. The design requirements, principle of operation, mechanical design features and electronic design features of the sensor are discussed. The performance and characteristics of the sensor system, as measured during development testing, are also presented.

DTIC

Military Helicopters; Lubricating Oils; Transmissions (Machine Elements); Chips; Metal Particles

07

AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and onboard auxiliary power plants for aircraft.

19980218247 Advisory Group for Aerospace Research and Develop., Propulsion and Energetics Panel, Neuilly-Sur-Seine, France
Advanced Non-Intrusive Instrumentation for Propulsion Engines. *L'Instrumentation Non-Invasive Avancee pour les Propulseurs*

May 1998; 528p; In English; 90th, 20-24 Oct. 1997, Brussels, Belgium

Report No.(s): AD-A348957; AGARD-CP-598; ISBN 92-836-0055-X; No Copyright; Avail: CASI; A23, Hardcopy: A04.

Microfiche

Changes in engine technology such as higher temperatures, higher tip speeds, new metal/composite/ceramic materials together with radical changes in design philosophy will require amongst other prerequisites the ability to measure and to monitor key internal gas and structural characteristics. The symposium papers presented non-intrusive measurement and analysis technologies in the following categories: (1) Laser Point Measurements (11); (2) Absorption and Infrared Techniques (4); (3) Paints; (4) Surface Sensors (6); (4) Laser Induced Fluorescence (6); (5) Mechanical (7); (6) Films (5); and (7) Laser Planar Measurement (9) and a Keynote Address.

DTIC

Structural Design; Nonintrusive Measurement; Propulsion

19980218785 NASA Dryden Flight Research Center, Edwards, CA USA

Development and Testing of a High Stability Engine Control (HISTEC) System

Orme, John S., NASA Dryden Flight Research Center, USA; DeLaat, John C., NASA Lewis Research Center, USA; Southwick, Robert D., Pratt and Whitney Aircraft, USA; Gallops, George W., Pratt and Whitney Aircraft, USA; Doane, Paul M., Boeing Phantom Works, USA; Jul. 1998; 16p; In English; 34th; Propulsion, 13-15 Jul. 1998, Cleveland, OH, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Original contains color illustrations

Contract(s)/Grant(s): RTOP 529-20-04-00-33

Report No.(s): NASA/TM-1998-206562; H-2269; NAS 1.15:206562; AIAA Paper 98-3715; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Flight tests were recently completed to demonstrate an inlet-distortion-tolerant engine control system. These flight tests were part of NASA's High Stability Engine Control (HISTEC) program. The objective of the HISTEC program was to design, develop, and flight demonstrate an advanced integrated engine control system that uses measurement-based, real-time estimates of inlet airflow distortion to enhance engine stability. With improved stability and tolerance of inlet airflow distortion, future engine designs may benefit from a reduction in design stall-margin requirements and enhanced reliability, with a corresponding increase in performance and decrease in fuel consumption. This paper describes the HISTEC methodology, presents an aircraft test bed description (including HISTEC-specific modifications) and verification and validation ground tests. Additionally, flight test safety considerations, test plan and technique design and approach, and flight operations are addressed. Some illustrative results are presented to demonstrate the type of analysis and results produced from the flight test program.

Author

Engine Control; Control Systems Design; Fabrication; Performance Tests; Reliability; Ground Tests

19980218800 NASA Dryden Flight Research Center, Edwards, CA USA

Propulsion Flight Research at NASA Dryden From 1967 to 1997

Burcham, Frank W., Jr., NASA Dryden Flight Research Center, USA; Ray, Ronald J., NASA Dryden Flight Research Center, USA; Conners, Timothy R., NASA Dryden Flight Research Center, USA; Walsh, Kevin R., NASA Dryden Flight Research Center, USA; Jul. 1998; 26p; In English; 34th; Propulsion, 13-15 Jul. 1998, Cleveland, OH, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Contract(s)/Grant(s): RTOP 523-90-24-00-RP

Report No.(s): NASA/TP-1998-206554; H-2258; NAS 1.15:206554; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

From 1967 to 1997, pioneering propulsion flight research activities have been conceived and conducted at the NASA Dryden Flight Research Center. Many of these programs have been flown jointly with the USA Department of Defense, industry, or the Federal Aviation Administration. Propulsion research has been conducted on the XB-70, F-111 A, F-111E, YF-12, JetStar, B-720, MD-11, F-15, F-104, Highly Maneuverable Aircraft Technology, F-14, F/A-18, SR-71, and the hypersonic X-15 airplanes. Research studies have included inlet dynamics and control, in-flight thrust computation, integrated propulsion controls, inlet and boattail drag, wind tunnel-to-flight comparisons, digital engine controls, advanced engine control optimization algorithms, acoustics, antimisting kerosene, in-flight lift and drag, throttle response criteria, and thrust-vectoring vanes. A computer-controlled thrust system has been developed to land the F-15 and MD-11 airplanes without using any of the normal flight controls. An F-15 airplane has flown tests of axisymmetric thrust-vectoring nozzles. A linear aerospike rocket experiment has been developed and tested on the SR-71 airplane. This paper discusses some of the more unique flight programs, the results, lessons learned, and their impact on current technology.

Author

Research; Flight Characteristics; Propulsion; Dynamic Control; Intake Systems

19980218942 Minnesota Univ., Minneapolis, MN USA

Computation of Radiation Heat Transfer in Aeroengine Combustors *Final Report, 22 Nov. 1991 - 17 Jul. 1996*

Patankar, S. V., Minnesota Univ., USA; 1996; 20p; In English

Contract(s)/Grant(s): NCC3-238; No Copyright; Avail: CASI; A03; Hardcopy: A01; Microfiche

In this report the highlights of the research completed for the NASA are summarized. This research has been completed in the form of two Ph.D. theses by Chai (1994) and Parthasarathy (1996). Readers are referred to these theses for a complete details of the work and lists of references. In the following sections, first objectives of this research are introduced, then the finite-volume method for radiation heat transfer is described, and finally computations of radiative heat transfer in non-gray participating media is presented.

Author

Radiative Heat Transfer; Computation; Procedures

08

AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

19980217098 NASA Dryden Flight Research Center, Edwards, CA USA

Flight Stability and Control and Performance Results from the Linear Aerospike SR-71 Experiment (LASRE)

Moes, Timothy R., NASA Dryden Flight Research Center, USA; Cobleigh, Brent R., NASA Dryden Flight Research Center, USA; Cox, Timothy H., NASA Dryden Flight Research Center, USA; Conners, Timothy R., NASA Dryden Flight Research Center, USA; Hiff, Kenneth W., NASA Dryden Flight Research Center, USA; Powers, Bruce G., Analytical Services and Materials, Inc., USA; Aug. 1998; 30p; In English; Atmosphere Flight Mechanics, 10-12 Aug. 1998, Boston, MA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Contract(s)/Grant(s): RTOP 244-33-02

Report No.(s): NASA/TM-1998-206565; H-2276; NAS 1.15:206565; No Copyright; Avail: CASI; A03; Hardcopy: A01; Microfiche

The Linear Aerospike SR-71 Experiment (LASRE) is presently being conducted to test a 20-percent-scale version of the Linear Aerospike rocket engine. This rocket engine has been chosen to power the X-33 Single Stage to Orbit Technology Demonstrator Vehicle. The rocket engine was integrated into a lifting body configuration and mounted to the upper surface of an SR-71 aircraft. This paper presents stability and control results and performance results from the envelope expansion flight tests of the LASRE configuration up to Mach 1.8 and compares the results with wind tunnel predictions. Longitudinal stability and elevator control effectiveness were well-predicted from wind tunnel tests. Zero-lift pitching moment was mispredicted transonically. Directional stability, dihedral stability, and rudder effectiveness were overpredicted. The SR-71 handling qualities were never significantly impacted as a result of the missed predictions. Performance results confirmed the large amount of wind-tunnel-predicted transonic drag for the LASRE configuration. This drag increase made the performance of the vehicle so poor that acceleration through transonic Mach numbers could not be achieved on a hot day without depleting the available fuel.

Author

Flight Tests; Controllability; Aerospike Engines; Aerodynamic Stability; SR-71 Aircraft; Wind Tunnel Tests; Aircraft Performance

19980218164 McDonnell-Douglas Corp., Long Beach, CA USA

Sensitivity of Runway Occupancy Time (ROT) to Various Rollout and Turnoff (ROTO) Factors, Volume 2, Complete Set of Plotted Data *Final Report*

Goldthorpe, S. H., McDonnell-Douglas Corp., USA; Jun. 1997; 290p; In English

Contract(s)/Grant(s): NAS1-19730; RTOP 538-04-13-02

Report No.(s): NASA/CR-1997-201712/VOL2; NAS 1.26:201712/VOL2; CRAD-9206-TR-3306-Vol-2; No Copyright; Avail: CASI; A13; Hardcopy: A03; Microfiche

The Terminal Area Productivity (TAP) research program was initiated by NASA to increase the airport capacity for transport aircraft operations. One element of the research program is called Low Visibility Landing and Surface Operations (LVLASO). A goal of the LVLASO research is to develop transport aircraft technologies which reduce Runway Occupancy Time (ROT) so that it does not become the limiting factor in the terminal area operations that determine the capacity of a runway. Under LVLASO, the objective of this study was to determine the sensitivity of ROT to various factors associated with the Rollout and Turnoff (ROTO) operation for transport aircraft. The following operational factors were studied and are listed in the order of decreasing

ROT sensitivity: ice/flood runway surface condition, exit entrance ground speed, number of exits, high-speed exit locations and spacing, aircraft type, touchdown ground speed standard deviation, reverse thrust and braking method, accurate exit prediction capability, maximum reverse thrust availability, spiral-arc vs. circle-arc exit geometry, dry/slush/wet/snow runway surface condition, maximum allowed deceleration, auto asymmetric braking on exit, do not stow reverse thrust before the exit, touchdown longitudinal location standard deviation, flap setting, anti-skid efficiency, crosswind conditions, stopping on the exit and touchdown lateral offset.

Author

Runways; Runway Conditions; Aircraft Landing; Aircraft Approach Spacing; Arrivals; Takeoff; Flight Operations

19980218165 McDonnell-Douglas Corp., Long Beach, CA USA

Sensitivity of Runway Occupancy Time (ROT) to Various Rollout and Turnoff (ROTO) Factors, Volume I: Final Report
Goldthorpe, S. H., McDonnell-Douglas Corp., USA; Jun. 1997; 175p; In English

Contract(s)/Grant(s): NAS1-19730; RTOP 538-04-13-02

Report No.(s): NASA/CR-1997-201712/VOL1; NAS 1.26:201712/VOL1; CRAD-9206-TR-3306-Vol-1; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

The Terminal Area Productivity (TAP) research program was initiated by NASA to increase the airport capacity for transport aircraft operations. One element of the research program is called Low Visibility Landing and Surface Operations (LVLASO). A goal of the LVLASO research is to develop transport aircraft technologies which reduce Runway Occupancy Time (ROT) so that it does not become the limiting factor in the terminal area operations that determine the capacity of a runway. Under LVLASO, the objective of this study was to determine the sensitivity of ROT to various factors associated with the Rollout and Turnoff (ROTO) operation for transport aircraft. The following operational factors were studied and are listed in the order of decreasing ROT sensitivity: ice/flood runway surface condition, exit entrance ground speed, number of exits, high-speed exit locations and spacing, aircraft type, touchdown ground speed standard deviation, reverse thrust and braking method, accurate exit prediction capability, maximum reverse thrust availability, spiral-arc vs. circle-arc exit geometry, dry/slush/wet/snow runway surface condition, maximum allowed deceleration, auto asymmetric braking on exit, do not stow reverse thrust before the exit, touchdown longitudinal location standard deviation, flap setting, anti-skid efficiency, crosswind conditions, stopping on the exit and touchdown lateral offset.

Author

Runways; Runway Conditions; Aircraft Landing; Aircraft Approach Spacing; Arrivals; Takeoff; Flight Operations

19980218898 NASA Dryden Flight Research Center, Edwards, CA USA

On-Line Robust Modal Stability Prediction using Wavelet Processing

Brenner, Martin J., NASA Dryden Flight Research Center, USA; Lind, Rick, NASA Dryden Flight Research Center, USA; Sep. 1998; 18p; In English; 21st, 14-17 Sep. 1998, Melbourne, Australia; Sponsored by International Council of the Aeronautical Sciences, Sweden

Contract(s)/Grant(s): RTOP 529-50-04

Report No.(s): NASA/TM-1998-206550; II-2246; NAS 1.15:206550; ICAS-98-4.9.1; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Wavelet analysis for filtering and system identification has been used to improve the estimation of aeroservoelastic stability margins. The conservatism of the robust stability margins is reduced with parametric and nonparametric time-frequency analysis of flight data in the model validation process. Nonparametric wavelet processing of data is used to reduce the effects of external disturbances and unmodeled dynamics. Parametric estimates of modal stability are also extracted using the wavelet transform. Computation of robust stability margins for stability boundary prediction depends on uncertainty descriptions derived from the data for model validation. The F-18 High Alpha Research Vehicle aeroservoelastic flight test data demonstrates improved robust stability prediction by extension of the stability boundary beyond the flight regime. Guidelines and computation times are presented to show the efficiency and practical aspects of these procedures for on-line implementation. Feasibility of the method is shown for processing flight data from time-varying nonstationary test points.

Author

Stability; Aeroservoelasticity; System Identification; Estimates; Data Processing; Computation

19980218900 Army Aviation Systems Command, Aeroflightdynamics Directorate, Moffett Field, CA USA

Flight-Time Identification of a UH-60A Helicopter and Slung Load

Ciccolani, Luigi S., NASA Ames Research Center, USA; McCoy, Allen H., Naval Postgraduate School, USA; Tischler, Mark B., Army Aviation Systems Command, USA; Tucker, George E., NASA Ames Research Center, USA; Galenio, Pinhas, Israel Flight

Test Center, Israel; Marmar, Dani, Israel Flight Test Center, Israel, Apr. 1998; 26p; In English

Contract(s)/Grant(s): RTOP 581-30-22

Report No.(s): NASA/TM-1998-112231; A-9810861; NAS 1.15:112231; USAATCOM-TR-98-A-004; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper describes a flight test demonstration of a system for identification of the stability and handling qualities parameters of a helicopter-slung load configuration simultaneously with flight testing, and the results obtained. Tests were conducted with a UH-60A Black Hawk at speeds from hover to 80 kts. The principal test load was an instrumented 8 x 6 x 6 ft cargo container. The identification used frequency domain analysis in the frequency range to 2 Hz, and focussed on the longitudinal and lateral control axes since these are the axes most affected by the load pendulum modes in the frequency range of interest for handling qualities. Results were computed for stability margins, handling qualities parameters and load pendulum stability. The computations took an average of 4 minutes before clearing the aircraft to the next test point. Important reductions in handling qualities were computed in some cases, depending, on control axis and load-slung combination. A database, including load dynamics measurements, was accumulated for subsequent simulation development and validation.

Author

Flight Time; UH-60A Helicopter; Loads (Forces); Flight Tests; Stability; Controllability

09

RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways, aircraft repair and overhaul facilities, wind tunnels, shock tubes, and aircraft engine test stands.

19980217138 Brown Univ., Computer Graphics Group, Providence, RI USA

User Interface Technology Transfer to NASA's Virtual Wind Tunnel System *Final Report, 1 Apr. 1997 - 31 Mar. 1998*

vanDam, Andries, Brown Univ., USA; 1998; 32p; In English; Original contains color illustrations

Contract(s)/Grant(s): NCC2-5213; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Funded by NASA grants for four years, the Brown Computer Graphics Group has developed novel 3D user interfaces for desktop and immersive scientific visualization applications. This past grant period supported the design and development of a software library, the 3D Widget Library, which supports the construction and run-time management of 3D widgets. The 3D Widget Library is a mechanism for transferring user interface technology from the Brown Graphics Group to the Virtual Wind Tunnel system at NASA Ames as well as the public domain.

Author

Technology Transfer; Three Dimensional Models; Libraries; Computer Programs

19980218145 Texas Univ., Austin, TX USA

Electromagnetic Launchers for Use in Aircraft Launch at Sea

Still, Aaron M., Texas Univ., USA; May 1998; 172p; In English

Report No.(s): AD-A349709; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

The purpose of this thesis is to investigate the feasibility of an electromagnetic launcher for aircraft launch at sea, to accomplish this task, the performance requirements and physical constraints for an aircraft launcher were determined. Also, a review of previously used aircraft catapult was completed. In addition to this, an investigation into previously designed electromagnetic launchers was done. A review of electromagnetic launcher theory is also necessary. An investigation of different power systems was done. Finally, experimentation into the practical use of electromagnetic launchers must be done. All of this investigation led to the conclusion that the coilgun type of electromagnetic launchers meets all of the requirements to be used to launch aircraft at sea.

DTIC

Electromagnetic Propulsion; Seats; Electromagnetism; Sea Launching; Catapults

19980218776 Institute for Human Factors TNO, Soesterberg, Netherlands

Low-Cost Simulators 1c: Training Analysis of 9 Military Training Areas *Low-cost simulatoren 1c: Trainingsanalyse van 9 militaire trainingsgebieden*

vandenBosch, K., Institute for Human Factors TNO, Netherlands; Korteling, J. E., Institute for Human Factors TNO, Netherlands;

vanWinsum, W., Institute for Human Factors TNO, Netherlands; Nov. 10, 1997; 49p; In English

Contract(s)/Grant(s): A96/CO/363

Report No.(s): TNO-TM-97-A069; TD-97-0253; Copyright: Avail: Issuing Activity (TNO Human Factors Research Inst., Kampweg 5, 3769 DE Soesterberg, The Netherlands); US Sales Only, Hardcopy, Microfiche

The objective of the EUCLID RTP11.8 ELSTAR project 'Low-cost simulators' is to develop guidelines for the specification, development and application of low-cost training simulators. Low-cost simulators are trainers that, through the use of commercially available and emerging technologies, provide superior benefit-to-cost ratios when compared to full fidelity simulators. First, the full spectrum of military tasks is screened on their potential for cost-effective simulator training. Next, 9 training areas were defined covering those task domains for which further investigation of low-cost simulator training solutions seemed promising. Then, field research was conducted on actual training programmes in order to verify the initial selection. The data of the field investigations were used for analysing the training programmes to determine global functional requirements of training simulators. The present report presents the methods and results of those analyses. The goal of the analyses is to identify the critical task variables and cues for the training programmes of the defined 9 training areas. First, the principal subtasks of the training programme are identified and the nature of the task-specific skills are characterized (e.g. cognitive, perceptual-motor). Then, the functional requirements of learning environments in which the necessary skills can be learned, are addressed. Finally, for each training programme, the opportunities and restrictions for developing low-cost training simulator solutions are discussed. It is concluded that the results provide the information necessary to intelligently narrow down the current selection in the final phase of this work package.

Author

Low Cost; Training Devices; Training Simulators; Specifications; Fabrication

11

CHEMISTRY AND MATERIALS

Includes chemistry and materials (general); composite materials; inorganic and physical chemistry; metallic materials; nonmetallic materials; propellants and fuels; and materials processing.

19980215473 Joint Oil Analysis Program, Technical Support Center, Pensacola, FL USA

Energy Dispersive X-Ray Fluorescence Evaluation of Debris from F-18 Engine Oil Filters

Humphrey, Gary R., Joint Oil Analysis Program, USA; Whitlock, Robert, Joint Oil Analysis Program, USA; Little, D., Joint Oil Analysis Program, USA; Godin, R., Joint Oil Analysis Program, USA; Jan. 1998; 14p; In English; Prepared in collaboration with National Research Lab., Washington DC., and Canadian Dept. of National Defence, CFB Trenton, Ontario, Canada.

Report No.(s): AD-A347528; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Traditionally, the primary analytical instrument that monitors the "health" of mechanical oil systems in the U.S. Department of Defense (DoD) and Canadian Department of National Defence (CDND) is rotrode atomic emission spectroscopy (AES). The engine oil filter installed in the F-18 engine captures particles from the engine oil stream as small as 0.3 microns. This phenomenon renders AES surveillance of the F-18 engine oil system ineffective in detecting abnormal wear and impending engine failure. The debris that is extracted from the F-18 engine oil filter and captured on external filter media contains all the information necessary to detect abnormal wear and engine failure in the oil wetted sections of the F-18 engine. However, the debris is not in a suitable form to be analyzed by AES and requires considerable effort, time and hazardous chemicals to transform the debris into a form suitable for analysis by AES. A method has been developed at the JOAP-TSC that utilizes Energy Dispersive X-Ray Fluorescence (EDXRF) to analyze the debris extracted from the engine oil filter and captured on filter media with little effort. Warning levels for elements have been statistically derived. The EDXRF Filter Debris Analysis (FDA) method provided 100 or more operating hours of advanced warning of engine failure. In addition, the EDXRF-FDA method can indicate the areas of wear in the engine. The Canadian Forces (CF) at Trenton in conjunction with GasTops LTD have developed and tested a prototype Deployable Filter Debris Analysis (DFDA) machine that automatically cleans F-18 engine oil filters. The instrument also segregates particles according to size and ferromagnetic properties. A comparison is made between the evaluations of the particles on the DFDA filter and EDXRF analysis of the same particulate samples.

DTIC

X Ray Fluorescence; Spectroscopy; Oils; Ferromagnetic Materials; Engine Failure; Detection; Debris; Atomic Spectra; Aircraft Engines

19980218246 University of West Florida, Pensacola, FL USA

Effects of Microbial Population Interactions on the Mobilization and Mineralization of Jet Fuel Final Report, 1 Jul. 1995 - 30 Jun. 1998

Synder, Richard A., University of West Florida, USA; Jun. 30, 1998; 6p; In English

Contract(s)/Grant(s): F49620-95-1-0442; AF Proj. 3484

Report No.(s): AD-A348966; AFRL-SR-BL-TR-98-0530; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This project will be initiated by the establishment of a culture collection isolated from contaminated drag strip soil (DSS) and clean Hudson River Sediment (HRS). Careful isolation, characterization, and long term maintenance of these bacteria and protists is critical for the success of the project. Bacteria will be characterized by sole carbon source utilization as well as standard morphological and chemical characteristics. Clonal cultures of protists will be identified by staining of morphological features for light microscopy, and characterized for their feeding and growth on the bacterial isolates obtained. Stable consortia of bacteria and protists in biphenyl cultures will be established and characterized. Retrieval of frozen consortia of bacteria and protists will be assessed. In addition, protists will be characterized for their sensitivity to biphenyl and Aroclors(R), and assayed for acquired resistance. Studies of sorption and transfer for Aroclors(R), in bacteria and protist cells will be conducted. This very basic microbial ecology work is time consuming, but is essential to lay the ground work for future experiments. Analysis of the role of protists in situ biodegradation will begin with inhibition and/or stimulation of native bacteria and protist populations. Experiments to determine the fate of *Alcaligenes eutrophus* H850 in soil samples with and without protists will also begin. The effects of nutrient limited growth and predation pressure as pre-adaptations to inoculation will also be determined.

DTIC

Jet Engine Fuels; Microbiology; Microorganisms; Mineralogy

19980218582 Army Tank-Automotive Research and Development Command, Warren, MI USA

Field Demonstration for P-D-680 Solvent Replacement, Part 2 Final Report

Rhee, In-Sik, Army Tank-Automotive Research and Development Command, USA; May 12, 1998; 100p; In English

Report No.(s): AD-A347365; TARDEC-TR-13751; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

As part of the second phase in development of environmentally compliant solvent alternatives to P-D-680, Navy field demonstrations were initiated at NADEP, Cherry Point, NC, NAWC, Patuxent River, MD, NSWC, Carderock Division, MD, and Naval Station, Mayport, FL. The main objectives of this demonstration were to validate performance of candidate solvents with existing Naval aviation and shipboard equipment, and to determine the environmental applicability for these candidate solvents. Two (2) petroleum based solvents and two (2) terpene/hydrocarbon blended solvents have been selected as candidates for these field demonstrations. NADEP evaluated four (4) candidate solvents in various Navy aviation and ground equipment (i.e., engine, bearings) at five (5) different types of repair/maintenance shops. NAWC evaluated a candidate solvent using IT-30 parts washer and aircraft support equipment (i.e., compressor valves, pistons, bearings, etc.). In the shipboard bearing cleaning applications, NSWC evaluated an odorless candidate solvent using an existing parts washer. Also, Naval station, Mayport evaluated an odorless candidate solvent in Navy missile cleaning applications. Field test results showed that both severe hydrotreated odorless hydrocarbon solvents and hydrotreated terpene/hydrocarbon blended solvents were well accepted in all applications. All candidate solvents tested were rated by users as acceptable replacements for F-D-680.

DTIC

Aircraft Equipment; Alternatives; Cleaning; Compressors; Crude Oil; Elastic Properties; Ground Support Equipment

19980218705 Lincoln Composites, Lincoln, NE USA

OMC Compressor Case Final Report

Humphrey, W. Donald, Lincoln Composites, USA; Nov. 1997; 76p; In English

Contract(s)/Grant(s): NAS3-27442; RTOP 523-21-13

Report No.(s): NASA/CR-1997-206227; E-10964; NAS 1.26:206227; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This report summarizes efforts expended in the development of an all-composite compressor case. Two pre-production units have been built, one utilizing V-CAP and one utilizing AFR-700B resin systems. Both units have been rig tested at elevated temperatures well above design limit loads. This report discusses the manufacturing processes, test results, and Finite Element Analysis performed. The V-CAP unit was funded by NASA-Lewis Research Center in 1994 under contract number NAS3- 27442 for Development of an All-Composite OMC Compressor Case. This contract was followed by an Air Force study in 1996 to build and identical unit using the AFR-700B resin system in place of the V-CAP system. The second compressor case was funded under U.S. Air Force contract F33615-93-D-5326, Advanced Materials for Aerospace Structures Special Studies (AMAS3), Delivery Order 0021 entitled "Advanced Polymeric Composite Materials and Structures Technology for Advanced High Temperature Gas Turbine Engines." Initial studies using the V-CAP resin system were undertaken in 1993 under a NASA Lewis contract (NAS3-26829). A first prototype unit was developed in a joint program between Textron-Lycoming (now Allied Signal) and Brunswick (now Lincoln Composites). This unit included composite end closures using low density, high temperature molded

end closures. The units was similar in size and shape to a titanium case currently used on the PT-210 engine and was funded as part of the integrated High Performance Turbine Engine Technology (EHPTE) initiative of DOD and NASA.

Author

Manufacturing; Compressors; Performance Tests; Evaluation; Technology Assessment

12 ENGINEERING

Includes engineering (general), communications and radar, electronics and electrical engineering, fluid mechanics and heat transfer, instrumentation and photography, lasers and masers, mechanical engineering, quality assurance and reliability, and structural mechanics.

19980215693 Defence and Civil Inst. of Environmental Medicine, Downsview, Ontario Canada

Progress in the Nondestructive Evaluation of CF-18 Composite Flight Controls for Water Ingress and Related Damage

Lepine, B. A., Defence and Civil Inst. of Environmental Medicine, Canada; McRae, K. L., Defence and Civil Inst. of Environmental Medicine, Canada; Jun. 1998; 21p; In English

Report No.(s): AD-A349697; DCIEM-98-TM-44; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In late 1995, the CF Nondestructive Testing Center (NDTC) at the Aerospace and Telecommunications Engineering Support Squadron (ATESS) in CFB Trenton arranged for a CF-18 to be sent and tested at the neutron radiography and X-ray facility at McClellan AFB, Sacramento, CA. As indicated in the subsequent inspection report, it was discovered that the right aileron and the left rudder had indications of moisture ingress in the graphite/epoxy skin layers or aluminum honeycomb core structure, as well as the possibility of corrosion in the core. After further NDT inspections of the rudder coordinated by ATESS at the Quality Engineering Test Establishment (QETE) and the Royal Military College of Canada (RMC), the skin was removed in the affected area to allow a physical assessment of the damage by QETE. Initial results indicated that the FM-300 bonding layer had broken down at the interfaces between the aluminum cells and the adhesive and that water was present in the cells, although corrosion products were not found. More details were presented in QETE's final investigation report, but the exact mechanism of water ingress could not be determined, and is still a mystery; several possible water/moisture entrance points have been explored.

DTIC

Damage Assessment; Ailerons; Neutron Radiography; Evaluation; Flight Control; Nondestructive Tests

19980216512 Naval Postgraduate School, Monterey, CA USA

Turbocharges to Small Turbojet Engines for Uninhabited Aerial Vehicles

Rivera, Gilbert D., Jr., Naval Postgraduate School, USA; Jun. 1998; 89p; In English

Report No.(s): AD-A346353; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Three test programs were conducted to provide the preliminary groundwork for the design of a small turbojet engine from turbocharger rotor components for possible Uninhabited Aerial Vehicle applications. The first program involved the performance mapping of the Garrett T2 turbocharger centrifugal compressor. The second program involved the bench testing of a small turbojet engine, the Sophia J450, at 115000 RPM, and comparing the results to another small turbojet, the JPX-240, from previously documented research. The compressor radii of the two engines were identical but greater than that of the Garrett compressor. The two engines, despite their physical similarities, had different fuel requirements. The J450 used heavy fuel (fuel pump required) while the JPX used liquid propane (pressurized fuel tank required). The third program involved the performance prediction of the J450 using GASTURB cycle analysis software. The compressor map generated from the Garrett T2 test was imported into GASTURB and used to predict the J450 performance at 94000, 105000, 115000, and 123000 RPM. The performance predictions agreed reasonably well with actual J450 performance.

DTIC

Turbojet Engines; Turbochargers; Centrifugal Compressors; Engine Parts; Engine Design; Fuel Pumps

19980217067 Department of National Defence, Ottawa, Ontario Canada

Engine Condition Monitoring System for the Canadian Forces F404-GE-400 Engine

Pare, M., Department of National Defence, Canada; Muir, D., GasTOPS Ltd., Canada; Apr. 24, 1998; 13p; In English

Report No.(s): AD-A347270; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

With the acquisition of the CF-18 fighter aircraft in 1982, the Canadian Forces have developed advanced engine condition monitoring techniques and software programs to aid in the life cycle management of the General Electric F404-GE-400 engine. The early programs that provided parts life and engine maintenance tracking have recently been replaced by PC-based, graphical

user interface systems that not only provide configuration and usage management, but have diagnostic and prognostic capabilities as well. These developments have made the Engine Condition Monitoring System (ECMS) unique among F-404 users and have conclusively demonstrated significant resource savings in terms of personnel and spares procurement in addition to increased effectiveness at all levels of maintenance. This paper describes the Engine Condition Monitoring System and the impact it has had on the CF-18/F404 engine maintenance program.

DTIC

Computer Programs; Aircraft Maintenance; Jet Engines; Engine Monitoring Instruments; Life (Durability)

19980218564 Naval War Coll., Joint Military Operations Dept., Newport, RI USA

Joint Vision 2010 Command and Control: A Case for Standing Joint Task Forces and Purple Aircraft Carriers. *Final Report*

VanDeusen, Karl J., Naval War Coll., USA; Feb. 13, 1998; 29p; In English

Report No.(s): AD-A349147; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Future use of military force in pursuit of national objectives will be conducted mostly by joint forces. Joint Task Forces (JTFs) provide the regional CINOs the means to execute military operations ranging from humanitarian assistance to a major theater of war. Unfortunately, the overall performance of JTFs are compromised by poor joint command and control. Improved joint command and control is attainable only through greater unity of effort and unity of command. In order to respond to these challenges the military needs to re-evaluate how to best form up a JTF and the optimal way to deploy them. The establishment of Standing Joint Task Forces (SJTFs) at each of the geographic CINC's headquarters is the first step in resolving these issues. Members of the SJTF work full-time for the JTF commander, whether at the headquarters or forward deployed. Their daily interactions foster greater efficiency, resulting in enhanced unity of effort. The second step entails embarking the SJTF aboard a deploying aircraft carrier. The co-location of commanders and staff breaks down service and functional stovepipes and provides greater unity of command, resulting in a more operationally effective JTF commander. Since Service parochialism tends to impede joint initiatives, this solution requires a top-down commitment to the guidance articulated in Joint Vision 2010 in order to be successful.

DTIC

Aircraft Carriers; Military Operations; Warfare

19980218604 NASA Lewis Research Center, Cleveland, OH USA

Aerodynamics of a Transitioning Turbine Stator Over a Range of Reynolds Numbers

Boyle, R. J., NASA Lewis Research Center, USA; Lucci, B. L., NASA Lewis Research Center, USA; Verhoff, V. G., NASA Lewis Research Center, USA; Camperchioli, W. P., NASA Lewis Research Center, USA; La, H., NASA Lewis Research Center, USA; Jun. 1998; 18p; In English; Turbo, 2-5 Jun. 1998, Stockholm, Sweden; Sponsored by American Society of Mechanical Engineers, USA

Contract(s)/Grant(s): RTOP 523-26-13

Report No.(s): NASA/TM-1998-208408; E-11243; NAS 1.15:208408; Rept-98-GT-285; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Midspan aerodynamic measurements for a three vane-four passage linear turbine vane cascade are given. The vane axial chord was 4.45 cm. Surface pressures and loss coefficients were measured at exit Mach numbers of 0.3, 0.7, and 0.9. Reynolds number was varied by a factor of six at the two highest Mach numbers, and by a factor of ten at the lowest Mach number. Measurements were made with and without a turbulence grid. Inlet turbulence intensities were less than 1% and greater than 10%. Length scales were also measured. Pressurized air fed the test section, and exited to a low pressure exhaust system. Maximum inlet pressure was two atmospheres. The minimum inlet pressure for an exit Mach number of 0.9 was one-third of an atmosphere, and at a Mach number of 0.3, the minimum pressure was half this value. The purpose of the test was to provide data for verification of turbine vane aerodynamic analyses, especially at low Reynolds numbers. Predictions obtained using a Navier-Stokes analysis with an algebraic turbulence model are also given.

Author

Aerodynamics; Turbines; Stators; Transition Points; Reynolds Number; Flow Measurement

19980218698 Cratech, Inc., Tahoka, TX USA

Small Scale Biomass Fueled Gas Turbine Engine

Craig, J. D., Cratech, Inc., USA; Purvis, C. R., Cratech, Inc., USA; 1998; 8p; In English, 2-5 Jun. 1998, Stockholm, Sweden

Report No.(s): PB98-151467; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The paper discusses a new-generation, small-scale (less than 20 MWe) biomass-fueled power plant that is being developed based on a gas turbine (Brayton Cycle) prime mover. The new power plants are also expected to economically utilize annual plant

growth materials (e.g., straw, grass, rice hulls, animal manure, cotton gin trash, and nut shells) that are not normally considered as fuel for power plants. The paper summarizes the new power generation concept with emphasis on the engineering challenges presented by the gas turbine component.

NTIS

Gas Turbine Engines; Biomass; Vegetation Growth; Electric Generators; Plants (Botany); Hulls (Structures)

13 GEOSCIENCES

Includes geosciences (general); earth resources and remote sensing; energy production and conversion; environment pollution; geophysics; meteorology and climatology; and oceanography.

19980218559 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Recirculating Industrial Air: The Impact on Air Compliance and Workers; Safety Case Study; Hill Air Force Base C-130 Painting Operations

LaPuma, Peter T., Air Force Inst. of Tech., USA; Jun. 29, 1998; 195p; In English

Report No.(s): AD-A348230; AFIT-98-010D; No Copyright; Avail: CASI; A09, Hardcopy; A03, Microfiche

The 1990 Clean Air Act Amendment resulted in new environmental regulations called the National Emission Standards for Hazardous Air Pollutants (NESHAPs). Industries such as painting facilities may have to treat large volumes of air, which drives the cost of an air control system. Recirculating a portion of the air back into the facility is an option to reduce the amount of air to be treated. A guided computer model written in Microsoft Excel 97% is developed to analyze worker safety and compliance costs with a focus on recirculation. The model has a chemical database containing over 1300 chemicals and requires inputs such as tasks performed, hazardous products used, and chemical make-up of the products. The model will predict indoor air concentrations in relation to occupational exposure limits (OELs). A case study is performed on a C-130 aircraft painting facility at Hill AFB, UT. The Aerospace NESHAP requires air pollution reductions in aircraft painting operations. The model predicts strontium chromate concentrations found in primer paints will reach 1000 times the OEL. Strontium chromate and other solid particulates & nearly unaffected by recirculation because the air is filtered prior to recirculation. The next highest chemical, hexamethylene diisocyanate (HDI), increases from 2.6 to 10.5 times the OEL at 0% and 75% recirculation, respectively. Due to the level of respiratory protection required for the strontium chromate, workers & well protected from the modest increases in concentrations caused by recirculating 75%. The initial cost of a VOC control system with no recirculation is \$4.5 million and \$1.8 million at 75% recirculation. To decide the best operating conditions for a facility, all options such as product substitution, operational changes or recirculation should be explored. The model is an excellent tool to evaluate these options.

DTIC

Paints; Hazardous Materials; Respiratory Diseases; C-130 Aircraft; Industries; Safety; Air Quality; Air Pollution; Circulation

14 LIFE SCIENCES

Includes life sciences (general); aerospace medicine; behavioral sciences; man/system technology and life support; and space biology.

19980216735 Texas Univ. Health Science Center, School of Public Health, Houston, TX USA

Incidence of USA Air Force Aircrew Fatigue in the Operational Setting

Lee, Karl E., Texas Univ. Health Science Center, USA; Jun. 10, 1998; 65p; In English

Report No.(s): AD-A346896; AFIT-98-025; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Though subjective fatigue measures have been utilized in assessing aircrew fatigue, no studies to date have attempted to establish its overall incidence in the USAF flying community. The purpose of this study was to investigate the incidence of subjective fatigue in the USAF operational environment, looking specifically at those pilots and flight engineers that regularly fly long transport missions. The study group included all pilots and flight engineers belonging to the USA Air Force Reserve's 68TH Airlift Squadron stationed at Kelly AFB, TX. This squadron has approximately 65 pilots and 70 flight engineers and utilizes the C-5 Galaxy transport aircraft exclusively. Pre and postmission questionnaires were completed prior to and at mission completion respectively. Throughout the mission, the study subjects completed a mission log, which tracked type of activity, serial fatigue rating, and place of sleep. Subjective fatigue was rated starting at mission onset, every four hours throughout the mission and at mission completion, that is, at time of engine shut down. Fatigue was measured using the School of Aerospace Medicine (SAM) seven point fatigue scale. Despite the endorsement of the wing commander, full support of the wing safety officer, two separate

briefings to the squadron at monthly safety briefings, and placement of questionnaire packets in over 135 individual's vertical files (V-files or "mail boxes), only six questionnaire packets were returned. Despite the lack of response, this study does serve as a pilot study, which together with lessons learned may prove useful in future studies of USAF aircrew fatigue in the operational setting. DTIC

Safety; Transport Aircraft; Sleep; Fatigue (Biology)

15

MATHEMATICAL AND COMPUTER SCIENCES

Includes mathematical and computer sciences (general); computer operations and hardware; computer programming and software; computer systems; cybernetics; numerical analysis; statistics and probability; systems analysis; and theoretical mathematics.

19980218702 Advisory Group for Aerospace Research and Development, Structures and Materials Panel, Neuilly-Sur-Seine, France

Virtual Manufacturing; La Fabrication Virtuelle

May 1998; 145p; In English; 85th, 13-14 Oct. 1997, Aalborg, Denmark

Report No.(s): AD-A346507; AGARD-R-821; ISBN 92-836-0053-3; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

No Abstract

Author

Computer Aided Design; Aircraft Design

16

PHYSICS

Includes physics (general); acoustics; atomic and molecular physics; nuclear and high-energy; optics; plasma physics; solid-state physics; and thermodynamics and statistical physics.

19980217678 BBN Systems and Technologies Corp., Canoga Park, CA USA

Comparison of Predictors of the Annoyance of Commuter, Stage II and Stage III Aircraft Overflights as Heard Outdoors
Pearsons, Karl, BBN Systems and Technologies Corp., USA; Howe, Richard, BBN Systems and Technologies Corp., USA; Sneddon, Matthew, BBN Systems and Technologies Corp., USA; Silvati, Laura, BBN Systems and Technologies Corp., USA; Fidell, Sanford, BBN Systems and Technologies Corp., USA; Dec. 1997; 86p; In English

Contract(s)/Grant(s): NAS1-20101; RTOP 538-03-15-01

Report No.(s): NASA/CR-1997-205812; NAS 1.26:205812; BBN-8201; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Thirty audiometrically screened test participants judged the relative annoyance of two comparison (variable level) signals and thirty standard (fixed level) signals in an adaptive paired comparison psychoacoustic study. The signal ensemble included commuter, Stage II and Stage III aircraft overflights, as well as synthesized aircraft noise signatures. All test signals were presented for judgement as heard outdoors, in the presence of continuous background noise, under free-field listening conditions in an anechoic chamber. Analyses of the performance of 30 noise metrics as predictors of these annoyance judgments confirmed that the more complex metrics were generally more accurate and precise predictors than the simpler methods. EPNL was slightly less accurate and precise as a predictor of the annoyance judgments than a duration-adjusted variant of Zwicker's Loudness Level.

Author

Aircraft Noise; Human Reactions; Responses; Human Behavior; Psychoacoustics; Psychological Effects; Predictions; Psychological Tests

19980217679 Harris, Miller, Miller and Hanson, Inc., Burlington, MA USA

Attitudinal Responses to Changes in Noise Exposure in Residential Communities

Horonjeff, Richard D., Harris, Miller, Miller and Hanson, Inc., USA; Robert, William E., Harris, Miller, Miller and Hanson, Inc., USA; Dec. 1997; 150p; In English

Contract(s)/Grant(s): NAS1-20102; RTOP 538-03-15-01

Report No.(s): NASA/CR-1997-205813; NAS 1.26:205813; HMMH-293350; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

The purpose of this study is (1) to investigate the current body of knowledge encompassing two related topics: (a) to what extent can we reliably predict the change in people's attitudes in response to an abrupt change in noise exposure, and (b) after the change, is there a decay in the abrupt-change effect whereby people's attitudes slowly shift from their initial reaction to a steady-state value? and (2) to provide recommendations for any future work that may be needed. The literature search located 23 studies relating to one or both of the above topics. These prior studies shed considerable light on the current ability to predict initial reaction and decay effects. The literature makes one point very clear: Great care in both experimental design and data analysis is necessary to produce credible, convincing findings, both in the reanalysis of existing data and for planning future data acquisition and analysis studies. New airport studies must be designed to minimize nuisance variables and avoid past design features that may have introduced sufficient unexplained variance to mask sought after effects. Additionally, the study must be designed to tie in with previous investigations by incorporating similar survey questions and techniques.

Author

Human Behavior; Aircraft Noise; Exposure; Human Reactions; Psychological Effects; Noise Pollution

19980217970 Air Force Research Lab., Edwards AFB, CA USA

The Influence of Combustion Noise on Acoustic Instabilities

Burnley, V. S., Air Force Research Lab., USA; Culick, F. E. C., California Inst. of Tech., USA; 34th JANNAF Combustion Subcommittee Meeting; Oct. 1997; Volume 2, pp. 93-122; In English; Also announced as 19980217960

Contract(s)/Grant(s): N00014-95-1-1338; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

Although flows in combustors contain considerable noise, arising from several kinds of sources, there is a sound basis for treating organized oscillations as distinct motions. That has been an essential assumption incorporated in virtually all treatments of combustion instabilities. However, certain characteristics of the organized or deterministic motions seem to have the nature of stochastic processes. For example, the amplitudes in limit cycles always exhibit a random character and even the occurrence of instabilities seems occasionally to possess some statistical features. Analysis of nonlinear coherent motions in the presence of stochastic sources is therefore an important part of the theory. We report here a few results for organized oscillations in the presence of noise. The most significant deficiency of this work is that, owing to the low level of current understanding, the stochastic sources of noise are modeled in ad hoc fashion and are not founded on a solid physical basis appropriate to combustion chambers.

Author

Combustion Chambers; Acoustic Instability; Internal Combustion Engines; Aircraft Engines; Fuel Consumption

Subject Term Index

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